

Application No. 10/733,584

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**AMENDMENTS TO THE CLAIMS:**

This listing of claims will replace all prior versions, and listings, of claims in the application:

**LISTING OF CLAIMS:**

1. (Currently Amended) A method for identifying ~~an expert~~hub experts within a community of users and authoritative items in a recommender system, comprising:

identifying items in a particular field provided by users within the community;

for each identified item:

determining which users within the community have acted upon the identified item;

determining which of the users who have acted upon the identified item are aware of other relevant items in the particular field and have not directly produced items in the particular field; and

defining those users as hub experts in the particular field;

determining which identified items have been acted upon by a predetermined number of hub experts; ~~and~~

defining those items as authoritative items; and

associating the hub experts with the authoritative items;

wherein the determining steps comprise:

defining a connectivity matrix  $M$ , wherein element  $M_{ij}$  is non-zero if and only if there is an arc from node  $i$  to node  $j$ ;

wherein for a given node  $i$ ,  $a_i$  is an "authority" value and  $h_i$  is a "hub" value, such that:

$$a_i = \sum_j M_{ji} h_j \text{ and } h_i = \sum_j M_{ij} a_j,$$

whose solutions are the principal eigenvectors of  $MM^T$  and  $MM'$ , respectively; and

defining vectors  $a = [a_1, a_2, \dots, a_n]'$  and  $h = [h_1, h_2, \dots, h_n]'$ , such that  $a = M'h = M'Ma$ , and  $h = Ma = MM'h$ .

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2. (Original) The method of claim 1, further comprising associating names of the hub experts with the authoritative items.

3. (Original) The method of claim 1, acting upon an item comprises one of reading the item, reviewing the item, commenting on the item and recommending the item.

4. (Original) The method of claim 3, wherein recommending an item comprises submitting a numerical rating.

5. (Original) The method of claim 3, wherein recommending an item comprises a submitting a numerical rating and a comment.

6. (Canceled).

7. (Previously Presented) The method of claim 1, wherein node  $i$  represents an authoritative item and node  $j$  represents a hub expert; and

wherein  $a$  represents an authority value for an authoritative item and wherein  $h$  represents a hub value for a hub expert.

8. (Previously Presented) The method of claim 1, wherein  $M_{ij}$  is 1 if and only if there is an arc from node  $i$  to node  $j$ .

9. (Original) The method of claim 7, wherein  $M_{ij}$  is  $\max-|r_{ij}-R_j|$ , where  $\max$  denotes the maximal rating possible,  $r_{ij}$  denotes the rating of user  $i$  for item  $j$  and  $R_j$  denotes the average rating of item  $j$  so far.

10. (Currently Amended) A method for identifying an expert hub experts and authoritative experts within a community of users in a recommender system, comprising:  
identifying items in a particular field created by users within the community;  
for each identified item:

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determining which users within the community have acted upon the identified item;

determining which of the users who have acted upon the identified item are aware of other relevant items in the particular field; and

defining those users as hub experts in the particular field;

determining which users creating identified items have had their identified items acted upon by a predetermined number of hub experts; and

defining those users as authoritative experts; and

associating the hub experts with the authoritative experts;

wherein the determining steps comprise:

defining a connectivity matrix  $M$ , wherein element  $M_{ij}$  is non-zero if and only if there is an arc from node  $i$  to node  $j$ ;

wherein for a given node  $i$ ,  $a_i$  is an "authority" value and  $h_i$  is a "hub" value, such that:

$$a_i = \sum_j M_{ji} h_j \text{ and } h_i = \sum_j M_{ij} a_j,$$

whose solutions are the principal eigenvectors of  $MM^T$  and  $MM'$ , respectively; and

defining vectors  $a = [a_1, a_2, \dots, a_n]'$  and  $h = [h_1, h_2, \dots, h_n]'$ , such that  $a = M'h = M'Ma$ , and  $h = Ma = MM'h$ .

11. (Original) The method of claim 10, further comprising associating names of the hub experts with the authoritative experts.

12. (Original) The method of claim 10, acting upon an item comprises one of reading the item, reviewing the item, commenting on the item and recommending the item.

13. (Original) The method of claim 12, wherein recommending an item comprises submitting a numerical rating.

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14. (Original) The method of claim 12, wherein recommending an item comprises a submitting a numerical rating and a comment.

15. (Canceled).

16. (Previously Presented) The method of claim 10, wherein node  $i$  represents an authoritative expert and node  $j$  represents a hub expert; and

wherein  $a$  represents an authority value for an authoritative expert and wherein  $h$  represents a hub value for a hub expert.

17. (Original) The method of claim 16, wherein an arc between users B and A is only added if the ratings of A and B for the current item are within the same range, e.g., do not differ by a predetermined value.

18. (Currently Amended) A recommender system for recommending items to users in a community of interest, comprising:

a memory storing: items provided by users in a particular field within the community; and for each identified item: ratings for the item made by other users in the system and a list of any hub expert users associated with the item; and

a processor for identifying items in the particular field provided by users within the community; for each identified item: for determining which users within the community have acted upon the identified item; for determining which of the users who have acted upon the identified document are aware of other relevant items in the particular field and have not directly produced items in the particular field; and for defining those users as hub experts in the particular field; for determining which identified items have been acted upon by a predetermined number of hub experts; and for defining those items as authoritative items and for associating hub experts with authoritative items;

the processor further for defining a connectivity matrix  $M$ , wherein element  $M_{ij}$  is non-zero if and only if there is an arc from node  $i$  to node  $j$ ; wherein for a given node  $i$ ,  $a_i$  is an "authority" value and  $h_i$  is a "hub" value, such that:  $a_i = \sum_j M_{ji} h_j$ , and  $h_i = \sum_j M_{ij} a_j$ ,

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whose solutions are the principal eigenvectors of  $MM_{-}$  and  $MM'$ , respectively; and defining vectors  $a = [a_1, a_2, \dots, a_n]'$  and  $h = [h_1, h_2, \dots, h_n]'$ , such that  $a = M'h = M'Ma$ , and  $h = Ma = MM'h$ .

19. (Currently Amended) A recommender system for identifying an expert within a community of users in a recommender system, comprising:

a memory storing: items provided by users in a particular field within the community; and for each identified item: ratings for the item made by other users in the system; a list of authoritative experts and a list of any hub expert users associated with the authoritative experts; and

a processor for identifying items in a particular field created by users within the community; for each identified item: for determining which users within the community have acted upon the identified item; for determining which of the users who have acted upon the identified document are aware of other relevant items in the particular field and have not directly produced items in the particular field; and for defining those users as hub experts in the particular field; for determining which users creating identified items have had their identified items acted upon by a predetermined number of hub experts; and for defining those users as authoritative experts; and for associating hub experts with authoritative experts;

the processor further for defining a connectivity matrix  $M$ , wherein element  $M_{ij}$  is non-zero if and only if there is an arc from node  $i$  to node  $j$ ; wherein for a given node  $i$ ,  $a_i$  is an "authority" value and  $h_i$  is a "hub" value, such that:  $a_i = \sum_j M_{ji}h_j$  and  $h_i = \sum_j M_{ij}a_j$ , whose solutions are the principal eigenvectors of  $MM_{-}$  and  $MM'$ , respectively; and defining vectors  $a = [a_1, a_2, \dots, a_n]'$  and  $h = [h_1, h_2, \dots, h_n]'$ , such that  $a = M'h = M'Ma$ , and  $h = Ma = MM'h$ .